

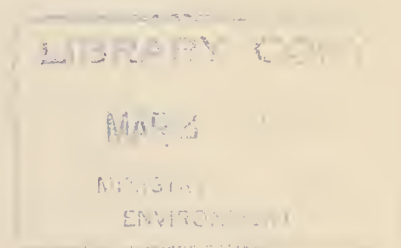
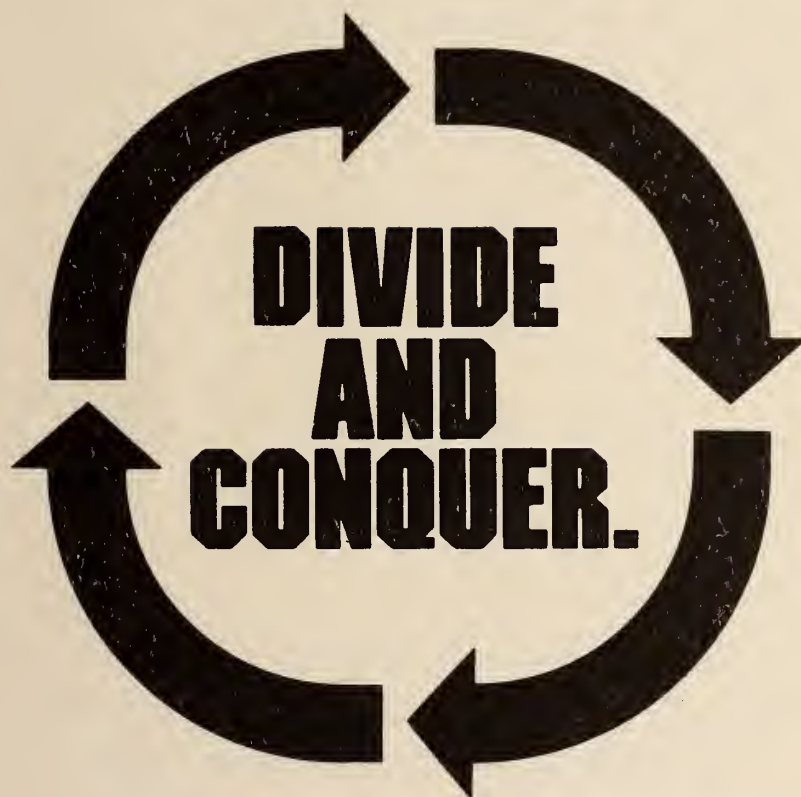
ONTARIO MINISTRY OF ENVIRONMENT



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A Teacher's Guide to Waste Management

Grades 4—6



Ministry
of the
Environment

Hon. Harry C. Parrott, D.D.S.,
Minister
Graham W. S. Scott, Q.C.,
Deputy Minister

To the Teacher:

This package of teaching resource materials has been assembled by the Ontario Ministry of the Environment as part of their environmental education program. The purpose of this manual is to provide teachers of Grades 4-6 with background information and classroom activities on the broad topic of solid waste. The activities first explore current throw-away habits and the resulting waste of valuable resources. Then the activities focus on what can be done to conserve and recover the resources we are wasting.

This unit is appropriate for adaptation into an existing junior science or social studies program and could be completed in three to four weeks depending on the scope of activities undertaken. It was originally tested in 1978 in several schools in Etobicoke, Toronto, Georgetown and Aurora. These communities were involved in the "Divide and Conquer" Program initiated by their Municipal Works Department and the Ontario Ministry of the Environment. For more information on the program see Section I the Ontario Ministry of the Environment's Waste Management Program.

The concepts and activities included in this teacher's materials package begin with an emphasis on the general topic of solid waste and its effects on our environment. From this background the lesson ideas then focus more directly on the students' homes and how each household can begin implementing the four R's of waste management - Reduce, Reuse, Recycle and Reclaim. Recycling for newspapers, cans and bottles is highlighted.

This teacher's kit is subdivided into four sections:

- Outline of Environment Ontario's Waste Management Program
- Concepts and Objectives of this manual
- Lesson Ideas
- Appendix of Teaching Resources

We hope that this teaching resource package provides practical bread-and-butter activities which are suited to your existing science or social studies programs. Comments and evaluations are welcomed.

Educational Resources Co-ordinator
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Ontario Ministry of the Environment
135 St. Clair Avenue West
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About the cover: Divide and Conquer

This title was chosen to convey the idea that if people learn to "divide" (separate at source) their garbage they will be able to "conquer" (overcome) present day disposal and resource depletion problems.

ACKNOWLEDGEMENTS

In preparing this "Divide and Conquer" teacher's kit, we have been grateful for the assistance of the following:

- Office of Energy Conservation, Department of Energy, Mines and Resources Canada, 580 Booth Street, Ottawa, Ontario for copies of "Garbage Gus", The Garbage Book, and Superkids.
- Ontario Science Centre, 770 Don Mills Road, Don Mill, Ontario for "Papermaking ... how to go about it", and assistance in the Composting activity.
- Alberta Environment, Communications Branch, 9820-106 Street, Edmonton, Alberta, T5K 2J6, for information on educational materials developed in western Canada on the topic of solid waste.
- John Madama, formerly of "Steppingstones", Somerville, Massachusetts for permission to use ideas and activities from Recycle which he developed under a grant from the U.S.A. Environmental Protection Agency.
- Environmental Action Coalition of New York, N.Y. on whose original work for the Don't Waste Waste curriculum Mr. Madama (above) based a major portion of his work.

"DIVIDE AND CONQUER"

TEACHER'S KIT (4-6)

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I. THE ONTARIO MINISTRY OF THE ENVIRONMENT'S WASTE MANAGEMENT PROGRAM

In 1970 the Ontario Ministry of the Environment assumed responsibility for waste management across the province and via the Environmental Protection Act of 1971 began planning, designing and implementing a co-ordinated program to deal with all aspects of Ontario's waste.

While the original objectives of their programs - to cover open garbage pits and close many undesirable disposal sites - were achieved, other problems have appeared. The amount of waste materials produced by our "throwaway" society is rapidly increasing; suitable landfill sites are becoming harder to find; and, valuable resource materials are being wasted when we bury them as garbage.

In 1974, for example, in Southern Ontario five million tonnes of garbage were produced by seven million people. This works out to a rate of 2 kg (four pounds) of garbage per person per day.

Assuming an annual increase of four per cent, solid waste would expand to 16 million tonnes in the next 20 years.

Equally important is the waste of resources and energy this garbage represents. We throw away more than two-and-a quarter million tonnes of paper and half-a million tonnes of metal every year. Two-and-a third million tonnes of this waste is packaging material.

OBJECTIVES

To deal with this enormous problem, the Ministry has established several new objectives:

1. to reduce the quantity of waste produced;
2. to recover to the greatest extent practical, resource materials and energy values contained in waste;
3. to reduce to a minimum the use of land for waste disposal;
4. and, to assist communities in the education of their residents about the concept of resource recovery and their roles in source separation.

KEY PROGRAMS

There are a number of key programs by which the Ministry hopes to achieve its objectives.

I. MUNICIPAL ASSISTANCE

Environment Ontario offers municipalities a 50 per cent subsidy for the construction of resource recovery plants with 40 - year financing of the balance of capital costs. This financing should make it possible for a municipality to invest in a \$15 million plant to reclaim metal, paper, cardboard and fuel from a 1,000 ton per day plant.

II. ONTARIO CENTRE FOR RESOURCE RECOVERY

As recycling and reclamation ultimately depend on reliable markets for the reclaimed goods, the Ministry is attempting to establish and to develop these markets through its Centre for Resource Recovery in Downsview, Ontario.

This \$14.5 million facility is a functioning Resource Recovery Plant capable of handling up to 600 tons of refuse on a two-shift a day basis. Equally important, it is the laboratory in which various technologies and methods are tested and proven

with the aim of producing a wide range of separated materials and fuels for market development.

The plant has been functioning efficiently since 1978 as a transfer station for Metro Toronto Garbage, handling as much as 900 tons a day.

Separated paper and light combustible wastes processed through the plant are now being used as a fuel enrichment in The Canada Cement LaFarge Kilns in Woodstock replacing some of the coal normally used. Eventually the refuse-derived fuel (RDF) should replace fifty per cent of the coal.

If this experiment succeeds, it will provide a good, stable market for refuse-derived fuel and the cement company's fuel costs will be reduced.

Another promising market for reclaimed paper from the Resource Recovery Plant is its potential for use as insulation material.

Reliable markets for reclaimed steel are also being developed through the secondary metals industry.

III. SOFT DRINK CONTAINERS

To reduce solid waste and conserve energy, Ontario has also legislated a regulation to restore the Province-wide availability of soft drinks in refillable containers.

By law, Ontario residents are guaranteed the right to purchase carbonated soft drinks in refillable bottles and to return empty bottles and receive a cash deposit from all retail vendors who sell pop.

The Soft Drink Industry has also agreed to return the marketplace to a state of 75 per cent refillable containers.

IV. AREA WASTE MANAGEMENT STUDIES

The Ministry is also financing a number of area waste management studies to improve existing waste management systems and to determine the suitability of resource recovery plants in various

communities around the province as well as the proper timing for any development of the facilities.

V. SOURCE SEPARATION BY HOUSEHOLDERS

Throughout 1978 and '79 a project entitled "Divide and Conquer" was initiated under the joint efforts of Environment Ontario and the Municipal Works Departments in four Ontario municipalities - Georgetown, City of Toronto, Aurora and Etobicoke - to establish the best method of encouraging residents to separate newspapers, bottles and cans at "source" (in their homes) for eventual recycling.

The Ministry undertook the co-ordination and research aspects of the overall program while each municipality's Works Department was responsible for the actual collection of the separated newspapers, glass and cans.

Depending on several factors, the Works Department in some communities picked up the source separated materials at curbside just as it did with the regular weekly garbage and in other communities, householders took their separated materials to central depots.

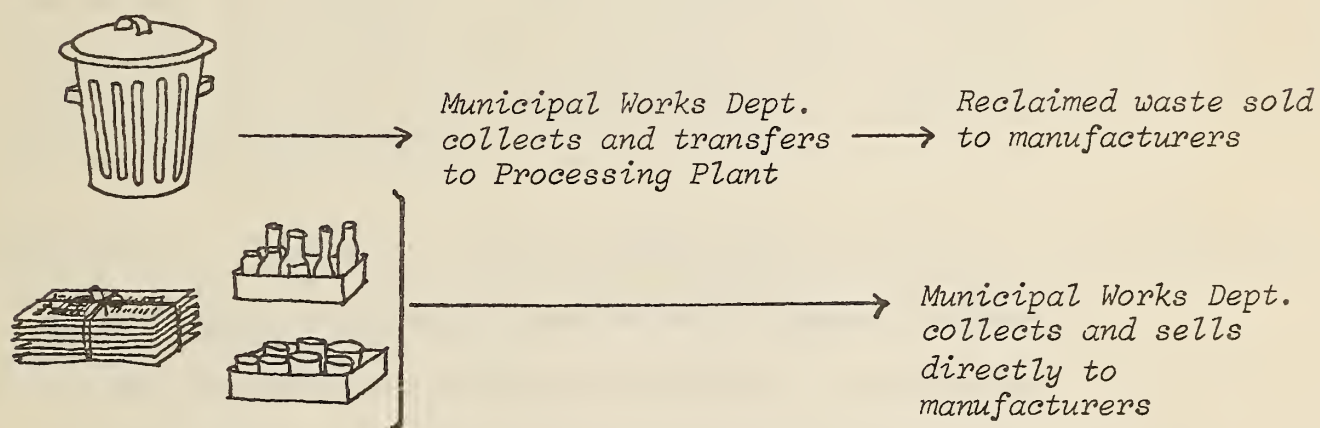
A report on the "Divide and Conquer" program, which will present the facts and offer suggestions for future projects, will be released by the Ministry in 1980.

VI. PAPER SEPARATION BY OFFICE WORKERS

Currently all downtown Ontario Government Office buildings are involved in the desk top recycling of office paper.

A new pamphlet entitled, "Guidelines for Office Separation and Recovery of Waste Paper" was prepared by the Ontario Waste Management Advisory Board and is available through the Ministry.

The Ministry feels that these source separation projects are extremely important. The separation of recyclable waste material - newspapers, glass and cans - at "source" in the home or workplace can be an important element in recovering our resources. As the following schematic indicates, source separated materials can be collected and recycled more directly:



A municipality could thus quite readily turn much of its recyclable waste into a saleable resource without requiring expensive plant facilities. Considering that newspapers, glass, and cans, comprise about 25% of our household waste source separation by householders could assist greatly in simplifying the resource recovery process.

In addition to encouraging the source separation of waste at home and in the workplace, Environment Ontario is also concerned that attitudes about waste change. Thus the aim of the province's separation Projects is not only to start residents recycling via source separation but also to get them to think about why so much waste is produced.

Once people look at garbage in terms of waste they can:

- buy less instant waste, i.e. disposables
- reuse and recycle in home, office and school
- separate for recycling and reclamation
- understand the extent and nature of the overall waste problem, and appreciate the need for resource recovery.

II. CONCEPTS AND OBJECTIVES

The topic of conserving and recovering our resources can be an intriguing one for students in the junior grades. With their growing independence comes a sense of personal responsibility for decisions and actions. Their concept of "community" is beginning to expand to include their province, their country. In the classroom and home they want to participate in shaping their physical and social environment.

Therefore, this unit has been designed to focus on the concepts of

- the implications of our growing waste problem
- the valuable resources we consume and discard
- the community and personal responsibilities involved in effective waste management

The overall objectives of the lesson ideas in the unit are to help junior students become

- aware of waste as a problem and as a resource
- interested in thinking about and changing their own and their families' waste habits
- aware of and understand the purpose of the switch to source separation in their community

III. LESSON IDEAS

This "Divide and Conquer" unit for grades 4-6 expands on the interrelationship between the student's waste habits and his/her community's garbage problems. The major theme is that not all waste is "garbage" and that through the 4R's approach - Reduce, Reuse, Recycle, Reclaim - each student, each family, can actively help in conserving and recovering our resources.

The unit can be completed in 10-15 lessons depending on the scope and depth of activities undertaken. Appropriate vocabulary is stressed along with both creative and research writing topics. Science and math activities have been chosen to help students "experience" the problems and opportunities associated with waste management. Social issues are addressed in the discussions on the implications of our current lifestyle for our natural resources.

The lessons are centred around four broad questions:

- A. WHY IS SOLID WASTE A GROWING PROBLEM?
- B. IS IT REALLY ALL GARBAGE?
- C. WHAT CAN WE DO ABOUT GROWING WASTES AND SHRINKING RESOURCES?
- D. HOW CAN I "DIVIDE AND CONQUER" WASTE?

The following sections review necessary background information for the teacher and suggest activities through which the class can address the major questions.

A. WHY IS SOLID WASTE A GROWING PROBLEM?

The activities in this introductory section look at the influences of population growth and our "throw away" lifestyle on the growth of solid waste materials. In addition, disposal methods to date and their related problems are also reviewed.

BACKGROUND FOR THE TEACHER

The mere mathematics of our growing amounts of solid wastes are staggering. Each year Canadians dispose of 450,000 cars, 5 billion cans, 22 million tires, 3 billion bottles and jars. Paper products alone account for almost half of every household's weekly garbage. The total solid waste discarded per person averages almost 2 kg daily, for an annual total of 680 kg or the equivalent of a 60 metre high garbage can! Furthermore, preliminary statistics gathered by the Ontario Waste Management Advisory Board indicate that our average daily output is increasing and could easily exceed 2 kg per person per day in the near future. "Add to this the steady increase in population and you can see why some people predict that we may eventually drown in our own garbage".¹

But what of the causes? The underlying causes of our waste habits and attitudes are evident in our changing lifestyles. While pioneer Canadians used and reused machinery and clothing until it wore out, Canadians in the 1970's rely on convenience goods, self-serve and disposable packaging, plus fashion not

1. *The Garbage Book*, Office of Energy Conservation, Dept. of Energy, Mines and Resources Canada, 1976, p.10

function as the criterion for throwing things out. It is not surprising that an affluent nation like Canada generates 680 kg of garbage per person annually compared to 90 kg per person in India. Packaging alone is the largest component (38%) of waste in most urban Canadian households.²

Since 1970, when the Ontario Ministry of the Environment took over responsibility for waste management across the province, sanitary landfill has replaced open dumps as a method of waste disposal.³ Solid waste is transported to these sites from nearby urban centres. Alternating layers of waste and earth are built up often into the shape of a "hill". Completed landfill sites can be converted into recreational parks and/or ski hills as in Etobicoke's Centennial Park. Landfill sites are nevertheless not the final answer to our waste problems, mainly because they "bury" valuable resources.

LESSON

OUTLINES

To introduce students to the concept of solid waste as a real problem this section explores the following questions:

1. WHAT'S IN OUR GARBAGE?
2. WHAT ARE THE MATHEMATICS OF SOLID WASTE?
3. WHY DO WE HAVE SO MUCH WASTE?
4. WHERE DO WE PUT IT ALL?

The major emphasis is on the staggering amount of waste we are producing and how it is related to our lifestyle.

2. *The Garbage Book*, pp. 14-15

3. For further background information, see Facts Sheet "Selecting a Landfill Site" in Appendix.

1. WHAT'S IN OUR GARBAGE?

Vocabulary ● waste, garbage, refuse, junk and scrap and other words students use to name "material which is considered valueless"

Discussion ● Ask students to define waste and suggest synonyms

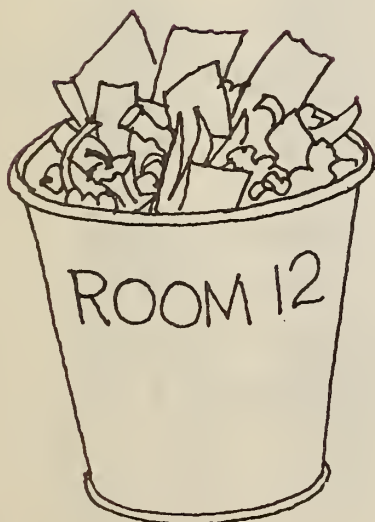
● Explore the idea that "what I may consider waste has value for someone else"
i.e., waste is relative to your needs and is not always an absolute category

Activities ● Make individual collages or drawings to represent each student's picture of "waste" or "garbage"

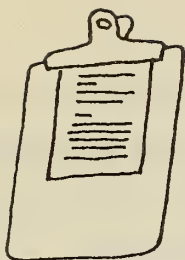
(Note: if most of the pictures show waste as all jumbled up, unorganized, literally items thrown together, raise this as a discussion point afterwards)

● As a group examine, categorize and count up the types of items in the classroom wastebasket. Record findings as a bar chart or as fractions or percentages whichever is appropriate.

PAPER 8 items	FOOD 6 items	CANS 4 items	MISC. 2
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TYPES OF			
ITEMS	#	FRACTION	%
PAPER	8	8/20	40%
FOOD	6	6/20	30%
CANS	4	4/20	20%
MISC.	2	2/20	20%
TOTAL	20	20/20	100%



- Interview the school caretaker for his opinion on the major categories of waste produced at your school. Does he mention "lost" items as a big "waste"?
- Interview parents re: major categories of waste at home and business

2. WHAT ARE THE MATHEMATICS OF SOLID WASTE?

Vocabulary

- mass (kilograms, tonnes) population, produce (verb) products

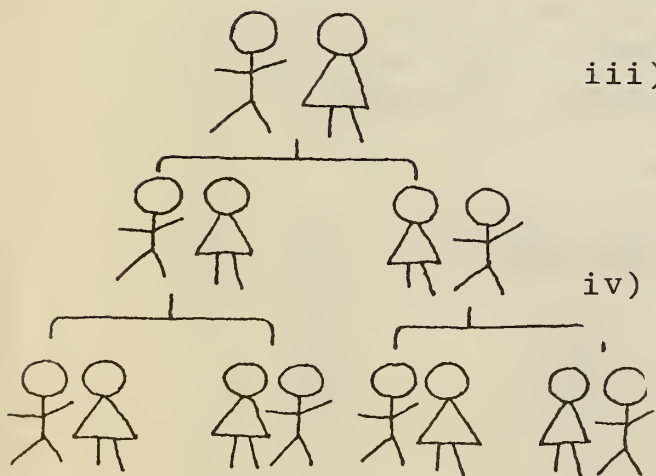
Discussion

- Review concept of multiplication, i.e., a number of items increases rapidly
- A major problem with waste is that it is multiplying so fast. Why? More people x more products = more garbage.

Activities

- To illustrate how our growing population makes our wastes multiply, use the following exercise:

- Mark off a square about 2 m x 2 m on classroom floor. Place a box of scrap paper inside the square.
- Have a boy and girl enter square and pick up one piece of paper each and drop it on the floor inside the square.
- Have their "children" and then "spouses" enter square and again each pick up a piece of paper from the box and drop it on the floor.
- Have four grandchildren, 8 great grandchildren, 16 great great grandchildren, etc., enter square in sequence and each pick up a piece of paper and drop it on the floor.

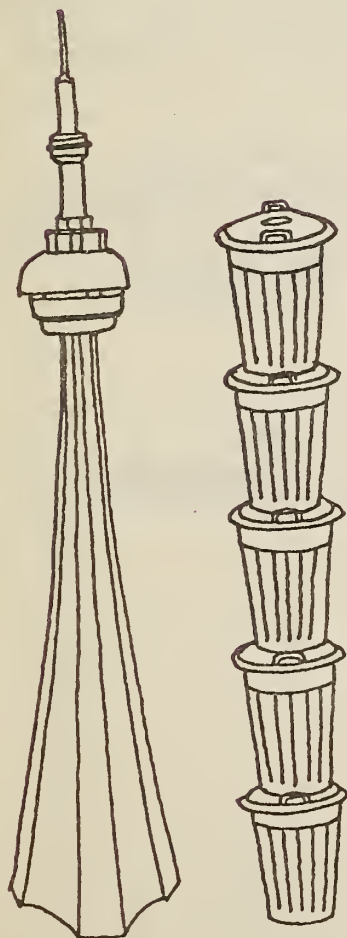




v) Once square is full have children step outside and note the accumulated "waste". Discuss this accumulation as it relates to the "multiplication" of people. Discuss the "multiplication" effect of 2 or 3 or more pieces of "waste" per person.

- Introduce the "Garbage Gus" poster and instructions for weighing the weekly garbage at home. (Suggest that students take the bathroom scale to the location of the garbage bags/cans not vice versa!) Instruct students to continue weighing garbage before each collection for 4-6 weeks in order to see if some of the later activities help to reduce Gus' weight.

- Present some of the following data to students and help them make up multiplication questions to demonstrate just how much waste we're producing.



- i) One Canadian produces a total of about 2 kg per day in his/her activities at home, school, work etc.
- ii) Of his/her 2 kg/day total a Canadian produces about 0.75 kg/day at home
- iii) 365 days/year
- iv) 1000 kg = 1 metric ton
- v) The number of people in our family is _____
- vi) 10% of our household waste is newspaper, 8% is cans, 7% is glass.
- vii) Population of _____ is _____,000
our community
- viii) Population of Ontario is 8,265,000
- ix) Population of Canada is 23 million
- x) One Canadian's annual waste would require a garbage can about 60 metres high
- xi) The CN tower is 545 metres tall

xii) Metropolitan Toronto produces about 7000 tonnes of waste daily.

xiii) Our community produces _____% of what Metro Toronto does each day.

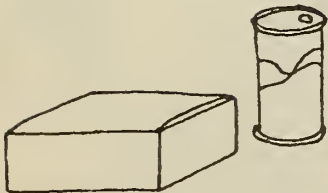
- see also Eco-News - "The Math of Mess" from Environmental Action Coalition.

3. WHY DO WE HAVE SO MUCH WASTE?

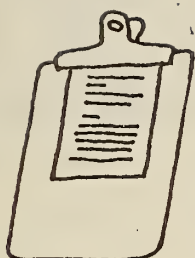
Vocabulary • lifestyle, affluence, obsolescence, fashion, disposable, convenience, self-serve, make-over, hand-me-down, made-do, scrimp

Discussion • Compare our current lifestyle with that of Canadians 100 years ago: where did food come from, how was it packaged, what was done with food scraps? Where did clothing and furniture come from? How were they packaged? What was done with them when they wore out? Do we buy new clothes, new cars, new furniture, when they wear out or when they're just out of fashion?

Activities • Using chart paper, write up the menu for one student's favourite meal. List the packaging associated with each item. Compare these foods and packages to those used by Canadians 100 years ago.



1978		1878	
<u>Menu</u>	<u>Packaging</u>	<u>Menu</u>	<u>Packaging</u>



- Interview a grandparent or elderly neighbour about his/her opinions on how we've become more wasteful since the Great Depression.

Did they have as much packaging or many "plastic" items back then? What did they do with clothing and furniture they didn't want? Did they even have much that they didn't want? Did they "makeover" anything? What kinds of appliances did they not have then? Did they have "throw away" packages of sugar, salt, pepper, ketchup, jams, etc. at restaurants? What did they use instead? Did they use paper towels in the kitchen? Did pop come in cans? Did they have milk in plastic bags?

The major focus of these questions is on the difference that affluence and packaging have made in the last 40 years.

- See also ECO-NEWS "Grandma Was An Ecologist"

4. WHERE DO WE PUT IT ALL?

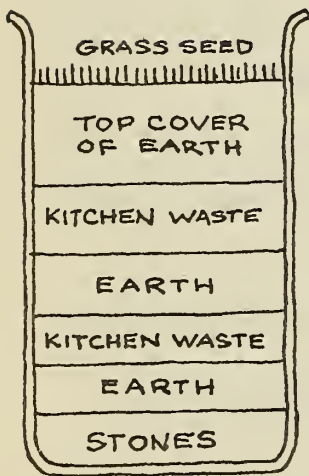
Vocabulary ● open dump, incineration, litter, sanitary landfill, compacting, transferring, municipal works department, collection, disposal

Discussion ● Ask students where they put their garbage, who collects it and where it goes then. (Contact the local municipal works department commissioner beforehand for details in your community. Some towns employ private collection firms at a "per tonnage" rate.)

- Show part 1 of the "Waste Watchers" slide show from Environment Ontario and review methods to date for disposing of solid wastes, and some of the associated pollution and "aesthetic" problems.⁴

Activities

- Build a mini sanitary landfill site in the classroom using a tall large glass beaker, some earth, household kitchen wastes such as food scraps, plastic wrap, coloured paper towelling, newspaper, aluminum foil lids from tin cans, marbles to simulate glass bottles.



Demonstrate how a sanitary landfill site is layered and discuss how the daily earth covering prevents many of the problems associated with open dumps. After adding the final deep earth cover, plant grass, watercress or radish seeds, keep the soil moist until seeds sprout then water fairly often to simulate how rain would soak through the layers. (Be sure to plant some seeds right next to the glass so their germination and root growth can also be observed).

Keep this sanitary landfill site in the classroom for several weeks, watering regularly to soak lower layers and observe any signs of decomposition in the layers of kitchen waste. Also note if any leaching of "rusty" or other coloured water occurs down to the bottom layer of stones.

4. Write to Educational Resources Co-ordinator Information Services Branch, Environment Ontario, 135 St. Clair Ave. W., Toronto, M4V 1P5. (Part 1 is comprised of slides 1-34)



- Create a "litter collage" with objects found in the school yard. Note that litter is really only the "tip of the iceberg" as our really major volume of waste is buried. Nevertheless the kinds of litter found still reflect our generally affluent lifestyle and thoughtless waste habits

- See also ECO-NEWS "Where does all the garbage go?"
- Write to Environment Canada for a video tape illustrating a sanitary landfill operation (see Appendix)

B. IS IT REALLY ALL GARBAGE?

In this section the students focus on the valuable resources - both non-renewable and renewable - that make up the papers, cans, bottles and other containers we throw out as garbage.

BACKGROUND FOR THE TEACHER

All of the items in our household waste - both natural and manufactured - can be traced back to the earth's natural resources.⁵ Many of these resources - petroleum, iron, bauxite (for aluminum) tin, soda ash, limestone, are non-renewable and in varying degrees of supply. Wood products are made from a renewable resource but our rate of consumption could outstrip our ability to reproduce enough trees unless we keep monitoring the supply and demand. In fact this could possibly happen in the U.S. by the early 1980's. Readily available sources of petroleum in Canada are now predicted to meet our demands only until the early 1980's after which point we will have to rely on alternative energy sources, petroleum purchased from other countries and more expensive drilling and refining methods for processing Canada's remaining petroleum resources.

Studies of the composition of our household wastes indicate that newspapers, glass and cans account for a total of 25% of our daily wastes. This one-quarter of our household garbage contains valuable resources which can be recycled and re-manufactured into new goods. Furthermore if we recycled only half of our food and yard wastes by composting we could reduce our household garbage by a further 10-15%. Finally, by rejecting over-packaged goods and reusing others we could further reduce our household wastes by 10-20%.

5. See Fact Sheet from Environment Ontario on "Recycle and Save Our Resources" for more details on aluminum glass and tin cans.

Not only would this slow down our drain on valuable resources but it would also help address our garbage disposal problems. Landfill would not be used up as quickly because we would no longer bury useful materials, and disposal costs could also be reduced. While costs for each municipality vary it has been estimated that Canadians have paid \$500 million dollars annually for collecting and disposing of their wastes, for an average of about \$25 per person per year! Multiply that figure by the population of your community!

LESSON OUTLINES

In exploring the topic of what's really contained in our garbage this section looks at:

1. THE "FAMILY TREE" OF OUR SOLID WASTE.
2. OUR SHRINKING BALANCE OF NATURAL RESOURCES.

The focus of these lessons is on "garbage" as a valuable resource.

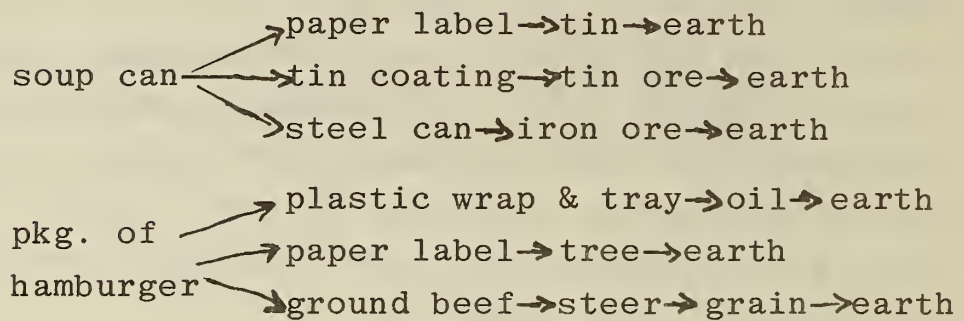
1. THE "FAMILY TREE" OF OUR SOLID WASTE.

Vocabulary ● family tree, manufacturing, raw materials, products, natural resources

Discussion ● ask students if any have traced their "family tree" - bring out concept of going back to "origins" to "roots"

Activities ● As a group, trace the family tree of a piece of paper:
paper → pulp → woodchips → log → tree
→ earth

- On chart paper draw up the "family trees" of several other items that occur regularly in our weekly household garbage:



- Note how all of our man-made resources such as paper, steel, can be traced back to the earth's natural resources. Ask if they can name something that is not made from one of earth's resources.

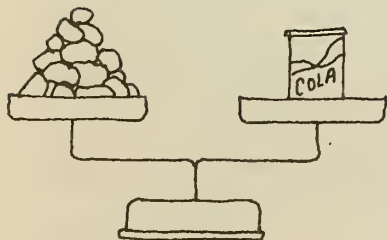
2. OUR SHRINKING BALANCE OF NATURAL RESOURCES

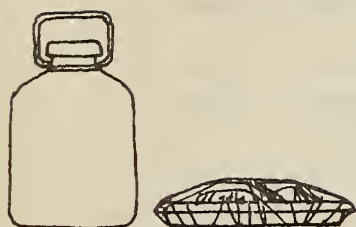
Vocabulary ● natural resources, renewable, non-renewable, man-made resources

Discussion ● Introduce the vocabulary above and have students indicate which items in the family trees are naturally occurring resources. which are renewable?

- What happens to our supply of non-renewable resources as we use them in manufacturing?

Activities ● Set up a pan balance with the label "Non-Renewable Resources" attached to one pan and "Waste" to the other. Fill the "N-R-R" pan with small rocks, to represent non-renewable ores such as bauxite, iron and tin. As you take a rock from the pan put it in a tin can or aluminum pop can and place in the "waste" side of the pan balance. Continue until all the





rocks are used up. Have students draw conclusions about our own wasteful use of non-renewable resources.

- Have students record all the containers used for the food for their evening meal.

FOOD	CONTAINER	RESOURCES USED
Milk	Plastic jug	Petroleum
Chicken	Plastic wrap & tray	Petroleum
etc.		

The following day each student can total the number of containers used. From this other calculations can be made: estimate for 3 meals per day; estimate for 365 days per year; yearly total for the class, or for all the classes in the school, etc.

Obtain the daily average for one family from the class total and apply this average to the number of households in your community. (eg. Aurora 3,600). Calculate a yearly total.

Again, refer to the contrast of our lifestyle with Canadians in 1878.

- Distribute students' "Resource Record" sheets with the following instructions:
 - (i) Keep a personal record for 2-3 days as you go about daily routines, listing the things used to accomplish the activities in the "Resource Record".
 - (ii) With a partner, trace the "family tree" of one item from each activity in the "Resource Record" (see example on following page)

- Suggested format for "Resource Record"

RESOURCE RECORD		
WHAT DO WE USE FOR?	MAN- MADE RESOURCES	FROM NATURAL RESOURCES
Eating	Fork	steel iron ore
Sleeping	Sheets	cotton
Drinking		
Moving		
Learning		
Playing		
Heating		
Shelter		

- See also ECO-NEWS "Packaging"
- To reinforce the concept of solid wastes containing valuable resources show Waste Watchers slide show Part II (from slide # 34 on). This also introduces the next section of lessons on the topic of Ontario's Resource Recovery program.

C. WHAT CAN WE DO ABOUT GROWING WASTES AND SHRINKING RESOURCES?

The purpose of this section is to introduce the broad concept of the "conserver"⁶ as opposed to the "consumer" society. More specifically, it looks at Environment Ontario's Resource Recovery program as well as the 4R's approach to waste management - Reduce, Recycle, Reuse, Reclaim.

BACKGROUND FOR THE TEACHER

In the economic boom, rapid growth and affluence of the 1960's we developed some very wasteful attitudes and habits. Elaborate packaging - both plastic and paper - developed as manufacturers vied for attention in the marketplace. Self service, fast food merchandising and growing problems with shoplifting all contributed to over-packaging and throw away containers - 4 picture hooks in a plastic bubble pack, styrofoam cups, paper trays and napkins, plastic utensils, etc. Energy and resources were in vast supply and cheap to obtain. The dawning of the age of the consumer had arrived!

However, in the 1970's both our economic and resource pictures have changed. The "unending" cheap supply of energy now has perceivable limits and the monetary and/or environmental costs of obtaining energy have risen. Resources for our diversified containers and packaging are neither infinite nor inexpensive. Finally, our rapid production of wastes has reached monstrous proportions. Thus, to combat two problems - shrinking resources and growing wastes - Environment Ontario has a Resource Recovery program as part of its overall waste management function. The four R's of waste watching

6. *The Science Council of Canada report, "Canada as a Consumer Society" (Report #27) is available for \$2.25 from Supply and Services Canada Publishing Centre, 270 Albert Street, Ottawa, Ontario.*

are designed primarily to reduce our garbage production and recover reusable resources. It's time for conserving and recovering rather than mindless consuming.

The Waste Management Branch of Ontario's Ministry of the Environment is currently involved in several areas of research and development. The major undertaking is the experimental facility in Downsview which is the first plant in Canada to combine both "front-end" processing of waste with "back-end" recovery technology in a single facility. The objective is to process a waste stream of up to 270 tonnes of Metro Toronto's waste daily, and produce saleable recyclable materials such as ferrous and non-ferrous metals, organic composting material, a glass mix and baled paper and cardboard. To ensure that these recovered materials re-enter the manufacturing cycle the Waste Management team is actively seeking out potential buyers and new uses for the recovered materials. As the quantity and quality of the recovered materials stabilizes, manufacturers will be able to rely more and more on this less expensive source of materials for their operations. Additionally, recovered resources represent savings in natural resources and the money and energy used to extract and refine them. Like the cycles in nature which maintain an ecosystem, we can also recover and recycle valuable wastes within our overall manufacturing/consuming system.

However, the concept of resource recovery does not only involve large scale technological processes. It also involves our personal efforts to act on the concept of conserving vs. consuming our resources. To do this in our daily lives Environment Ontario also advocates:

Reduce your waste - avoid over-packaged and one-use disposal goods; buy returnable containers; Recycle,

Reuse and Reclaim your papers, magazines, clothes, organic wastes, etc.

Recycle your waste - separate newspapers, glass and cans for pick-up or depot; be sure to return refillable containers to the store for your deposit.

Reuse your waste - take magazines to the doctor's waiting room, hospital or senior citizens' home; donate used clothing to charity; use food bottles and bags for refrigerating left-overs, pickling, etc.

Reclaim your waste - discover new uses for old packages, twist ties, wood scraps, fabrics, paints; repair old toys, furniture or pass them along; compost food scraps and yard waste.

The following lessons explore these four personal roles in waste management as well as the province's role in large scale resource recovery operations.

LESSON

OUTLINES

The purpose of these lessons is to illustrate the concepts and practical applications of resource recovery in Ontario. The section is divided into:

1. PUT WASTE ON A DIET - REDUCE!
2. LEARN A LESSON FROM NATURE - RECYCLE!
3. PASS IT ON - REUSE!
4. USE YOUR IMAGINATION - RECLAIM!
5. DON'T BURY RESOURCES - RECOVER!

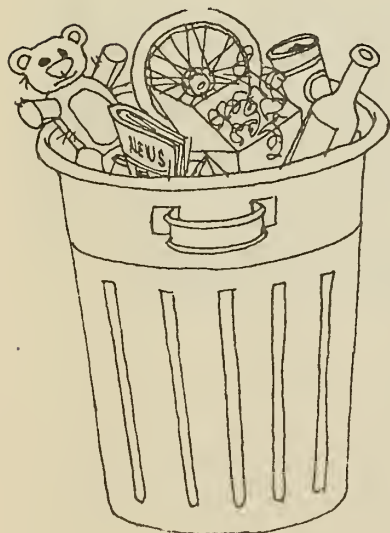
The major emphasis is on how habits that the students themselves can initiate at home and school will help meet Ontario's Resource Recovery objectives.

1. PUT WASTE ON A DIET - REDUCE!

Vocabulary • diet, reducing, weight, waste, waist

Discussion • Introduce homonyms waste and waist and ask students about the reasons for dieting and how this concept can apply to both waste/waist.

Activities • List some of the items we throw out weekly or at spring clean-up. Note which ones represent unnecessary garbage (paper towels, cans, newspapers, broken toys, plastic food bags, jars, etc.) Beside each item list either an item we could have used instead in the case of throw-aways (i.e., reusable j-cloth instead of one-use paper towel) or a further use for the item instead of disposing of it (i.e., fix toys, give away magazines, return pop bottles)





Review Garbage Gus results to date and set a "diet" target of reducing his waste by 1/10 to 1/4 in 4 weeks. Have students list what they did to reduce Gus' intake (i.e., save glass jars, separate newspapers)

2. LEARN A LESSON FROM NATURE - RECYCLE!

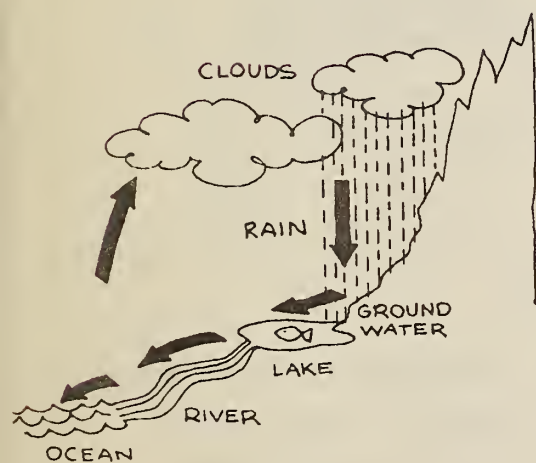
Vocabulary and

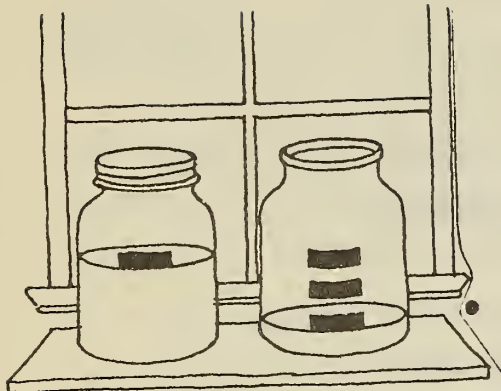
Discussion

- Prefix "re" meaning "again" as in redo, reopen, remember, refuel, restart, return, refill
- Stem verb "cycle" meaning "to move as in a circle" hence cycling, bicycle, tricycle; water cycle; evaporate, condense
- Concept of "recycle" meaning "to do or use over and over again"; decompose (and prefix "de"), compost, bacteria

Activities

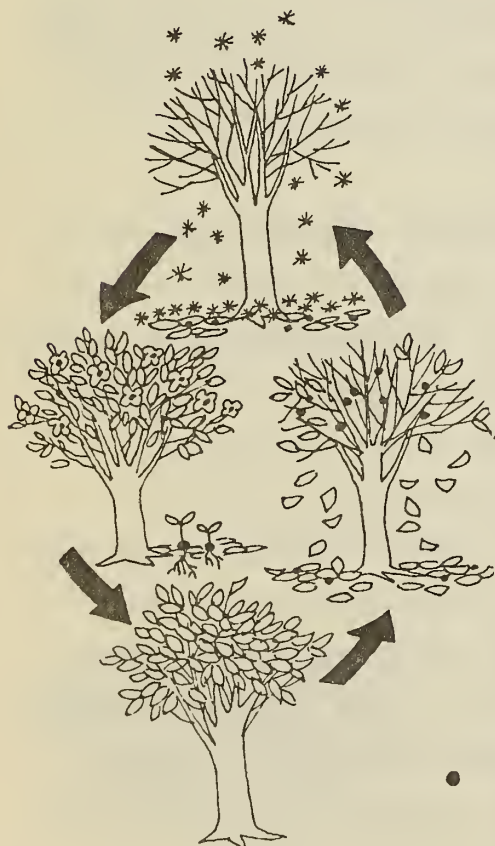
- Ask some students to describe how the seasons form an annual cycle, the moon a monthly cycle and the sun a daily cycle. Elicit the concepts of change and repetition of changes to create a pattern. As a follow-up have them make a diagram or picture illustrating one cycle.
- Introduce nature's water cycle. Note how water changes its form and the repeating pattern of changes. Begin by asking where the rain goes after it falls and bring out the following flow clouds→rain→ground→lakes/rivers/oceans→ clouds. Help students to illustrate this flow in a sketch.





- Set up an experiment to demonstrate evaporation. Attach a tape marker about half way up on each of two equal sizes jars. Fill each with water to the tape mark. Seal one with a lid. Place both on the window ledge and observe for a week. Mark changes in water level with tape on the open jar.

To explore the concept of recycling, investigate nature's process of plant growth, death, decomposition, and return to soil which fosters new plant growth. Emphasize decomposition as the first necessary step toward recycling. If leaves did not break down (decompose) they could not become reused as soil nutrients again.



(i) Observe trees in the school yard and note the effect of the current season on their state of growth.

(ii) Review the trees' annual cycle; spring - new leaf buds and "flowers"; summer - leaves produce chlorophyll to assist enzyme process necessary for tree growth, seeds also develop; autumn - chlorophyll production stops, leaves die and fall off, seeds also fall; winter - fallen leaves decompose through snow and cold action, seeds and buds dormant; spring - seeds germinate and take root in humus of decaying leaves beneath tree.

- Create a mold garden in the classroom. In a container about six inches in diameter place soil to a depth of one inch. Moisten (do not soak) the soil. Select a few pieces about 1/2 inch square from the following suggested materials: nut shells, stale bread, crackers, cereal, vegetable or fruit peels. Place your selected items on top of the soil layer. Cover container



with clear plastic wrap using elastic band to secure it. Each day remove the cover for several minutes to supply oxygen for the developing molds and add water if necessary.

Observe the colours of molds and add fungus which develop on each material and note how they help to decompose the material, i.e., break it down, so it can be absorbed back into the soil.

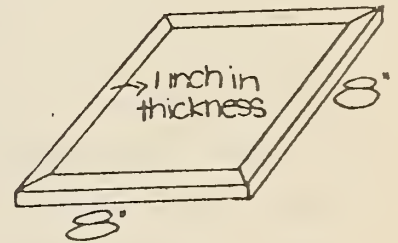
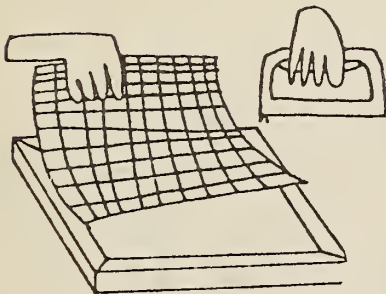
- Recycle paper and use it for artwork or letters. The following is reprinted from an info' sheet prepared by the Ontario Science Centre.

PAPERMAKING... HOW TO GO ABOUT IT...

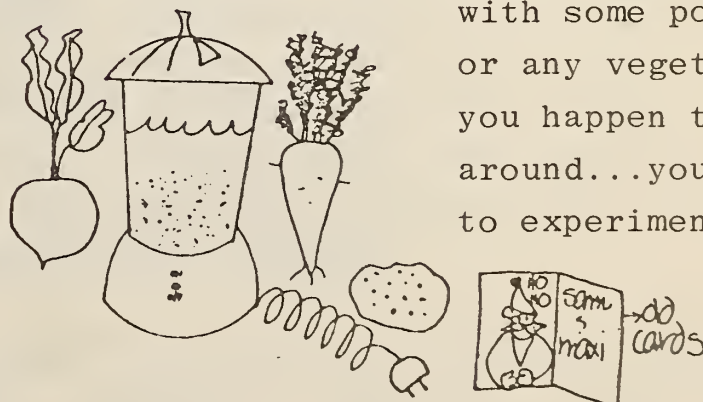
1) Make yourself a wooden screen from scrap pieces of wood

2) staple fly screening tightly and smoothly across the frame

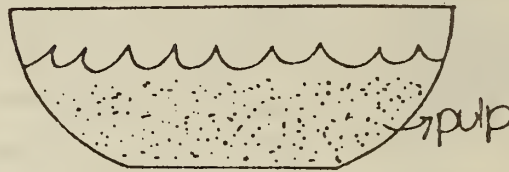
*use nylon flyscreening its easier on the fingers and doesn't rust!!!



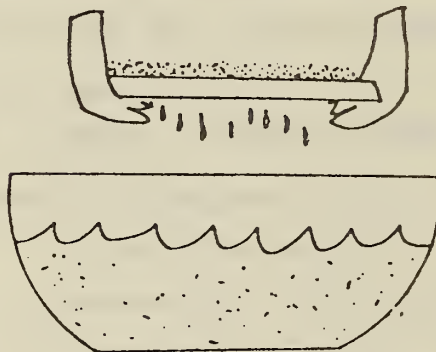
3) in a blender mash up an old christmas, birthday, or report card...along with some potato peels, or any vegetable fibre you happen to have around...you'll have to experiment.



- 4) Dump the mixture (called pulp) into a pail, tub or kitchen sink filled about 4" deep with water.

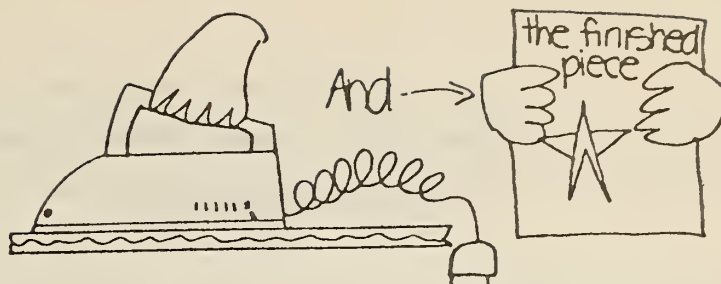


- 5) then grasp your screen in both hands, place it in the tub shake it gently from side to side, and in a single straight motion lift the screen out of the tub. The water will rush through the screening but the fibre will have evenly coated the screen.



*remember, try to keep the screen level, if it tips, $\frac{1}{2}$ your paper will be really thick, and $\frac{1}{2}$ will be too thin.

- 6) Now, to get your paper off the screen. (This is the tricky part). You will need some old newspapers,* laid on a table, and an iron. Take your screen turn it over and place it on the newspaper. Mop up the excess water with a sponge; then very very carefully lift up the screen. Your paper will remain on the newspaper. Next step is to iron the paper dry by putting a sheet of newspaper over the new paper so that the new paper doesn't tear, or anything... and that's all folks, good luck and good paper, your friends will be amazed. (*old cloths are better)



- For further information contact the Ontario Science Centre, 770 Don Mills Road.

Lead students in a discussion of the manufacturing-consuming system in which we all participate. Diagram it on the board and have students indicate how it could be changed from a one-way flow (resource→ manufactured goods→ consumer use→ waste→ disposal) to a cycle by recovering resources from our wastes. Discuss how man could thus create a technological model of an "eco-system".

- Have students investigate the commercial processes for recycling newspaper, cans and bottles on a large scale. Emphasize that "Recycling takes the old and makes it new"

newspaper/cardboard→ shredded into small pieces→ beaten with water into a pulpy mash→ water pressed out→ rolled and dried

glass→ melted in a furnace→ cooled and poured into molds for new bottles

tin cans→ dipped in caustic bath to dissolve tin→ remaining steel cans washed and sold → tin recovered as electrolyte and made into ingots to be reused.

- Write to the Institute of Scrap Iron and Steel, Inc. (address in Appendix). They have emphasis

on "Scrap is not Junk - It's a Supernatural Resource" and "The Scrap Cycle (in ISIS's Phoenix Quarterly, Vol. 6 No. 2 Summer 1974)

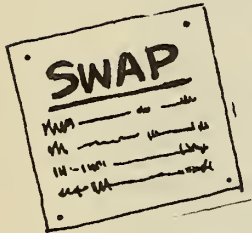
3. PASS IT ON - REUSE!

Vocabulary

- reuse, second-hand, charity, drop-box, swap, hand-me-down

Discussion

- From the list of "unnecessary garbage" we throw out (in part 1 of this section) have students select some items which they feel could be reused (i.e., for their original function) by others



Activity



- Set up a swap-session or swap want-ads in the class for students to exchange reusable items which they no longer want. Comic books, paperbacks and records are suggested.
- Start a "reuse" scrap paper box.

4. USE YOUR IMAGINATION - RECLAIM!

Vocabulary

- creativity, imagination, reclaim, compost

Discussion

- Depending on the verbal ability of the students, distinguish between reusing (i.e., using something over again in its original function) and reclaiming (i.e., developing a new use for something which otherwise would be thrown out.) Emphasize the creativity which is required. Brainstorm about possible creative reclamation of everyday household waste and large scale wastes (eg. tires) in

our communities. No idea is too far-fetched as it may lead to a plausible solution.

Activities



- Follow-up the brainstorming discussion by implementing some suggestions and/or try some of the following creative uses for waste
 - i) Create a terrarium in any large size glass container
 - ii) Start a "jug of life". Using a large glass container create a closed aquarium ecosystem. Fact sheet on "Constructing a Classroom Ecosystem" gives details (See Appendix)
 - iii) Use baby food jars to hold paints for classroom art centre.
- Find other creative suggestions in What To Do Until The Garbageman Arrives by Ruth Johnson. Mrs. Johnson is an active environmentalist in North York.
- Visit the Ontario Science Centre for a workshop on Composting and/or Recycling. Write for their hand-out on Composting (See Appendix for details on Visits and publications)
- Build a compost unit in class or at home as follows:
 - i) Fill a container (the size of a classroom wastebasket) half full of soil. The soil should be moist enough to clump together when squeezed in your hand but water should not squeeze out.
 - ii) Add in mixture of 10 parts vegetable peelings and 1 part animal waste. The vegetable peelings contribute Phosphates

and Potassium while animal wastes contribute Nitrogen. Animal wastes can be raw or cooked meats or even droppings from the classroom gerbil. Add egg shell too. Stir the whole mix.

- iii) Turn mixture over every day to aerate the soil (aerobic decomposition requires oxygen and keeps compost sweet smelling!)
- iv) Contact Ontario Science Centre for a fact sheet and for lesson on composting during your visit to the Centre.

5. DON'T BURY RESOURCES - RECOVER!

Vocabulary ● resource recovery, shredder, magnetic separator

Discussion ● Note that large scale reclamation is being investigated at the Ministry's Experimental Resource Recovery plant. It can recover resources from waste that we personally cannot recycle such as plastics, appliances beyond repair, cardboard, etc.

● To assist students in understanding how the processing technology of the plant operates review the concept of magnetism and what materials magnets attract. (Further information on this plant is contained in the Appendix.)

Activities ● Have students speculate on how a large resource recovery facility might operate:

- i) What categories of materials would be brought there ordinarily in our green garbage bags?

- ii) What would have to be done to large bulky items like refrigerators before their component materials could be recycled?
 - iii) How could metals be separated out?
(Magnets)
 - iv) How could paper be separated? (air suction like a vacuum cleaner)
 - v) How would materials be moved through the plant? (conveyor belts)
- Students can diagram and sketch their idea of what would happen to the garbage entering the plant and what products might come out. These could be highly imaginative, not necessarily "factual" as long as they convey the student's understanding that what goes "in" as waste comes "out" as a resource.
 - Alternatively, students interested in dramatic art could arrange themselves in a line and create a "Resource Recovery Machine" which has intake, shredding, conveying, separating and producing functions.
 - Contact the Ministry of the Environment's Waste Management Branch about a possible tour of the Resource Recovery Centre. (See Appendix)
 - Write to Environment Canada for two videotapes illustrating resource recovery operations in industry - "Solid Waste Utilization" and "Sam the Wrecker Man." See Appendix for details.

D. HOW CAN I "DIVIDE AND CONQUER" WASTE?

This section demonstrates how resource recovery can be assisted by every household in your community. The emphasis is on how to separate glass, cans, and newspapers at "source" (i.e., in the home) and what to do with these each week.

There are two sections of lessons:

1. GET THE "DIVIDE AND CONQUER" HABIT!
2. CHECK-UP ON YOUR WASTE!

The focus of these lessons is on making source separation a habit.

1. GET THE "DIVIDE AND CONQUER" HABIT!

Vocabulary ● "divide" (source separate) and "conquer" (help overcome our solid waste problems), habit

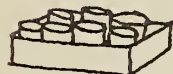
Discussion ● Review the concept of divide and conquer as it applies to attacking our garbage problem and to helping us recover resources

● Have students suggest a number of "good" and "bad" habits. What are the characteristics of a habit?

● Point out that "source separation" refers to separation of recyclable waste at source, i.e., at home. Discuss why this is preferable to total reliance on Resource Recovery Plants. (These plants cannot separate out glass or paper in a pure form which can be recycled directly back into "new" glass and paper products.)



Activities



- Bring in uncleaned, empty pop and food bottles, cans and loose newspapers. Discuss why it is best to rinse out containers (to avoid odours at home) and bundle or bag newspapers (makes handling easier). Discuss methods of separating at home.
- Have students experiment with the number of cans/bottles they can fit into various containers; paper bag, plastic grocery bag, metal or plastic waste basket. Evaluate the merits of each type of container: size, safety, reusable. Have students conclude on best type for home use.
- If your community has recycling depots or special garbage pickups for separated materials, make up a questionnaire and have each student survey 5 households on their street. Find out if these householders know about them, if they are participating, if not, why not, etc. See sample questions on following page.

QUESTIONNAIRE

1. Do you know about our community's recycling program?
2. a) Do you recycle?
b) If "yes" then why do you?
c) If "no" then why don't you?
3. Which is more important to you in recycling (choose one)
a) Saving money?
b) Reducing pollution?
c) Saving resources?
d) Saving energy?

Ditto a chart format for students to record their survey results individually and then total for the class.

<u>SURVEY RESPONSES</u>			
1.	Yes	/5	No /5
2.	a) Yes	/5	No /5
	b) Why		c) Why not
	_____		_____
	_____		_____
	_____		_____
3.	Money	/5	Pollution /5
	Resources	/5	Energy /5

- Write for the videotapes "Pay Your Money - Take Your Choice" and "A New Beginning" available from Environment Canada. (See Appendix)

2. CHECK UP ON YOUR WASTE!

Vocabulary

- Check up, monitoring, maintain

Discussion

- Discuss the problems associated with staying on a diet, or maintaining any habit which takes some effort, e.g., dental care requires check-ups, daily brushing, avoiding excessive sweets, etc.

Activities

- Students can record weekly and monthly totals of bottles and cans they separate at home. Newspapers can be weighed using bathroom scale (weight of student must be subtracted!)
- Note any drop in weight of "Garbage Gus" once source separation has begun
- Have a follow-up survey 2 months later and see if households are still separating or have started since last surveyed

- Invite a speaker from an environmental group to talk about their program and future plans
- Collect news articles on resource recovery and local waste management problems
- Nominate "Conquering Heroes" families special recognition for reducing "Garbage Gus" weight
- Challenge another class to put out the smallest amount of classroom waste for a month.

IV. APPENDIX OF TEACHING RESOURCES

To supplement the lesson ideas described in the previous section a review of additional teaching resources is provided here under the following headings:

- A. ENVIRONMENT ONTARIO'S "RESOURCE RECOVERY PLANT"
- B. GOVERNMENT RESOURCES FOR TEACHERS
 - 1. ENVIRONMENT ONTARIO'S INFORMATION SERVICES BRANCH
 - 2. ONTARIO SCIENCE CENTRE
 - 3. ENERGY, MINES AND RESOURCES CANADA
 - 4. ENVIRONMENT CANADA
- C. ENVIRONMENTALISTS' PUBLICATIONS
- D. INDUSTRY PUBLICATIONS
- E. OTHER TEACHER'S GUIDES

APPENDIX A

ENVIRONMENT ONTARIO'S RESOURCE RECOVERY PLANT

Environment Ontario is concerned with managing Ontario's waste and recovering valuable resources by supporting programs which Reduce, Reuse and Recycle and Reclaim our garbage.

To explore the potential of the "fourth" R - Reclamation - the Waste Management Branch of the Ministry has been responsible for developing the Ontario Centre for Resource Recovery in Downsview.

WHY AN EXPERIMENTAL RESOURCE RECOVERY PLANT?

The overall battle against our mounting garbage problem requires several equally important approaches. Manufacturers are being encouraged to reduce disposable packaging; householders are being asked to separate out reusable and recyclable materials from their other garbage; the provincial and municipal governments are developing more efficient garbage handling and large scale recovery operations.

As one part of Environment Ontario's long range plan for recovering resources from our garbage it has recently built the Ontario Centre for Resource Recovery in Downsview. Basically, its purpose is to test out the feasibility of mechanically separating massive tonnages of garbage into reusable materials. Data from the experimental processes will be available to communities considering such operations. In addition, markets (i.e., purchasers/users) for the recovered materials are also being developed. Such plants are intended to augment Ontario householders' roles in source separating their daily waste. The plants can deal with bulk wastes such as old appliances, commercial and industrial

wastes as well as non-separable household wastes. At present the plant is not capable of extracting glass or newspapers in as pure a form as householders can.

WHAT FURTHER INFORMATION IS AVAILABLE?

Students and teachers interested in the growing amount of research being done into large-scale resource recovery operations can obtain more detailed information on the processes and results of this plant and others like it in the U.S. from:

- Waste Management Branch

Ontario Ministry of the Environment

135 St. Clair Avenue West

Toronto, Ontario

M4V 1P5

Pamphlets describing the plant facilities and operation are available.

Plant tours can sometimes be arranged for school groups.

Call (416) 965-6191 for information.

- Information Services Branch

Ministry of the Environment

135 St. Clair Avenue West

Toronto, Ontario

M4V 1P5

Ontario's Environment Today (1977-78) a high school tabloid, contains an extensive article on resource recovery and the Experimental Plant.

- Environmental Action Committee

156 Fifth Avenue

N.Y.C., New York

10010

- The Waste Paper (July 1977), a newsletter, contains an article reviewing "Resource Recovery: Problems and Promises" to date in the U.S.
- National Centre for Resource Recovery, Inc.
1211 Connecticut Avenue
N.W. Washington, D.C.
20036

In conjunction with the National Association of Secondary School Principals has published Teacher and student guides. Resource Recovery and You provides an excellent overview.

- U.S. Environmental Protection Agency
Office Of Solid Waste Management Programs
Washington, D.C. 20460

Ask for reprints from Waste Age on "Waste Reduction and Resource Recovery - There's Room for Both" by Nick Humber and "Resource Recovery Through Multi-Material Source Separation" by Penelope M. Hansen. This office also publishes a list of "Current recommended readings on resource recovery and waste reduction" Environmental Protection Publication SN-536.

APPENDIX B

GOVERNMENT RESOURCES FOR TEACHERS

1. ENVIRONMENT ONTARIO'S INFORMATION SERVICES

Teachers and students wishing further information on any topic related specifically to solid wastes or to the general area of environmental studies, can contact:

Educational Resources Co-ordinator
Information Services Branch
Ontario Ministry of the Environment
135 St. Clair Avenue West
Toronto, Ontario
M4V 1P5

Included here are titles of a few of the available Facts sheets and other materials.

- Environment Ontario's Educational Materials - memo
- Envirofacts and Fun - tabloid
- Ontario's Environment Today - tabloid - 1978 edition
- Facts sheets
 - "It's Not All Garbage"
 - "Recycle and Save Our Resources"
 - "About Resource Recovery", June 1977
 - "Marketing - the Key to Success in Resource Recovery", August, 1977
 - "Constructing a Classroom Eco-system"
 - "Simple Composting of Household Waste", June 1977
 - "What Can One Family Do?"
- Guidelines for Office Separation and Recovery of Waste Paper - Brochure
- "1 Recycle" - Bumper Sticker
- The Ratchford Experiment - how one family can fight waste is illustrated in a brochure

- "The Waste Watchers" - a slide show suitable for grades 4-12.
- Ogg family (cartoon) posters for the classroom.
- Film - A Matter of Common Sense
Garbage begins in the home. One family's approach to controlling and recycling waste is related to the broad environmental issue. 13.5 minutes color. This film may be borrowed by writing to Modern Talking Picture Service, 143 Sparks Avenue, Willowdale, Ontario M2H 2S5.

2. ONTARIO SCIENCE CENTRE RESOURCES

The Ontario Science Centre offers Environmental Science programs to students in elementary and junior high school grades. Workshops for teachers' professional development are also arranged. The Centre also publishes hand-outs and a monthly tabloid.

Workshops (Grades 4-8)

- Composting
- Consumer Waste and Recycling

Demonstrations (all grades)

- Papermaking

Hand-outs

- "Ecology Begins at Home"
- "Papermakers of the World Unite"
- "Home Composting"

For further information and to book visits contact:

Ontario Science Centre
770 Don Mills Road
Don Mills, Ontario

3. ENERGY, MINES AND RESOURCES CANADA

Through the federal Department of Energy, Mines and Resources Office of Energy Conservation - three useful teaching materials are available:

- The Garbage Book provides background information for the teacher
- "Garbage Gus" poster for student activity of weighing weekly garbage
- Superkids a "comic book" adventure of energy issues, including an episode dealing with solid waste

For copies of these contact:

Office of Energy Conservation
 Dept. of Energy, Mines and Resources Canada
 580 Booth Street
 Ottawa, Ontario
 K1A 0E4

4. ENVIRONMENT CANADA

The Solid Waste Management Branch of Environment Canada is also undertaking research into the generation of solid waste and into source separation.

For a list of publications available write for "Solid Waste Management Publications and Services"

Solid Waste Management Branch
 Environmental Protection Service
 Environment Canada
 Ottawa, Ontario
 K1A 0H3

One of the interesting resources of this Branch for teachers and students is a selection of video tapes on a variety of issues in the solid waste management field. For example:

- "Pay Your Money. Take Your Choice". 58 minutes. A documentary report on the present state of source separation, examining Canadian and American recycling programs, with emphasis on mandatory separation.
- "Guelph's Sanitary Landfill". 28 minutes. The development of a small city sanitary landfill, from design through to construction, as described by Mr. Ray Funnell of the City Engineer's Office, City of Guelph.
- "Sanitary Landfilling". 10.5 minutes. Features the daily operations of Toronto's Beare Road Sanitary Landfill.
- "Solid Waste Utilization". 17 minutes. Resource recovery of several commodities is shown by observing the industrial operations which: 1) de-ink waste paper, 2) de-tin metal cans and other tin-coated ferrous products, 3) shred junked automobiles to recover high grade ferrous scrap, and 4) use glass cullet in the manufacture of new glass containers
- "Composting". 9.5 minutes. The concept of composting waste materials is introduced by observing a composting operation, Grow-Rich Organic Fertilizers, Windsor, Ontario.
- "Earth Search". 24 minutes. The step-by-step evolution of a solid waste management study, using as an actual case a report prepared for St. John's Newfoundland.

- "A New Beginning". 36 minutes. Documents in detail the experimental mandatory source separation projects launched in the winter of 1975 in Somerville and Marblehead, Mass.
- "Sam the Wrecker Man". 18 minutes. Describes the British Columbia government - sponsored auto reclamation program known as Project SAM.

APPENDIX C

ENVIRONMENTALISTS' PUBLICATIONS

The following groups have produced studies, newsletters and/or operate recycling programs. Since these are generally non-profit organizations we suggest that only one student contact them for publications.

- Pollution Probe
c/o University of Toronto
Toronto, Ontario
M5S 1A1
- Garbage Coalition
43 Queen's Park Cres. E.
Toronto, Ontario
(416-928-5432)
- IS FIVE Foundation
477 Dupont St.
Toronto, Ontario
M6G 1Y6
- Outdoors Unlimited Newsletter
200-1326 Johnston Road
White Rock
British Columbia
(see further details under Teacher's Guides)
- Environmental Action Coalition
156 5th Avenue
New York City, N.Y.
10010
(see further details under Teacher's Guides)

APPENDIX D

INDUSTRY PUBLICATIONS

The following associations have materials available for classroom use which express industry's point of view on environmental issues and resource recovery. Inquire about any costs for materials when you write.

- CARI - Canadian Association of Recycling Industries, 5799 Yonge Street, Suite 1101, Willowdale, Ontario, M2V 3V3

Publishes The Second Time Around explaining recycling of metals, glass, etc. in Canada. (\$1.25 for one copy - discounts for bulk orders).

- Continental Can Co. of Canada Ltd., 3080 Yonge Street, Toronto, Ontario, M4N 3N1, c/o Mr. Cameron.

Has available a teaching unit "No Time To Waste" including filmstrip and record data at a cost of about \$12.00.

- Glass Container Council of Canada, 67 Yonge Street, Suite 501, Toronto, Ontario.

Publishes "Glass Containers and the Environment"

- MCMAC - The Metal Containers Manufacturers Advisory Council
Attn: Mr. Bill Apted, American Can Co., 1 International Blvd., Rexdale, Ontario. M9W 1A1

Has articles and films available on request. Films are:

- i) "Resource Recovery is" which describes technology developed to date in the U.S. This film was produced by the National Centre for Resource Recovery.

ii) "The Last Resource" which looks at the potential for recovering metal containers from solid waste.

- PIC - Plastics Industry Council, 1262 Don Mills Road, Don Mills, Ontario, M3B 2W7

Publishes a four volume review of plastics - Background, Solid Waste, Environmental Impacts, Resource Recovery.

- ISIS - Institute of Scrap Iron and Steel Inc., 1729 H Street, N.W., Washington, D.C., 20006

Publishes Phoenix Quarterly containing articles about scrap as a resource. Also pamphlets such as "Scrap is not Junk". (The Phoenix Quarterly, Vol. 6, No. 2 summer 1974 contains an overview of the "Scrap Cycle" from mills to new products to scrap to mills again)

- Crothers Ltd. (Canadian dealer for Caterpillar Tractor Co.) Attn: Fred Walden, 1 Crothers Dr., P.O. Box 5511, Concord Ontario, L4K 1E2.

Will send out on request a film titled "The Trouble With Trash" reviewing the operation of a sanitary landfill site.

APPENDIX E

OTHER TEACHER'S GUIDES

Several public and private organizations have produced teacher's guides on the topics of Solid Waste and Resource Recovery. Inquire about costs for materials when you write.

- Outdoors Unlittered publishes a student newsletter entitled "Newslitter" and is developing teacher's guides for a "Solid Waste Unit for Elementary Schools" for grades K-6. Contact:
Outdoors Unlittered
#200-1326 Johnston Road
White Rock
British Columbia
- Environmental Action Coalition publishes a student newsletter Eco-News and a teacher's guide Don't Waste Waste for grades 4-6. E.A.C. also publishes a periodical called "Waste Paper" for the general public. The following Eco-News back-issues are relevant to Environment Ontario's "Divide and Conquer" teaching kit.
 - "The Math of Mess", March 1974 (with Teacher's Guide)
 - "Grandma Was An Ecologist", February 1973 (with Teacher's Guide)
 - "Where Does All The Garbage Go", January 1975 (with Teacher's Guide)
 - "Packaging", January 1973 (with Teacher's Guide)
 - "Make Jewels From Junk", in December 1971
 - "The Birth and Life Of A Piece of Paper", January 1972

For further information contact:

Environmental Action Coalition
c/o 156 5th Avenue
New York, N.Y.
10010

- Keep America Beautiful Inc. has developed individual teacher's guides for grades K-6 on "Waste Handling". These are available from:

Eliot Pratt Education Centre for Keep America
Beautiful Inc.
99 Park Avenue
New York, N.Y.
10016

- A "Resource Recovery Education Program" has been developed under the joint efforts of the National Association of Secondary School Principals and National Centre for Resource Recovery Inc. The materials include student and teacher guides in the areas of Resource Recovery and Industrial Arts/Science/Social Studies. Further information available from:

National Centre for Resource Recovery Inc.
1211 Connecticut Ave. N.W.
Washington, D.C.
20036

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